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The Plastic Poverty Premium: A Market Price Analysis of Small-Format Packaging in Sri Lanka

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Abstract - **Small-format packaging enables consumers to purchase products with a lower immediate cash outlay, however, the lower transaction price may conceal a higher unit cost and increased packaging intensity. This study examines the economic and environmental implications of small-format packaging in Sri Lanka using 125 market observations across eight consumer product categories. Small and larger package sizes were compared using unit prices, and the Plastic Poverty Premium was calculated as the percentage difference between their unit prices. Package-size ratios and the additional expenditure required to obtain equivalent quantities through small packages were also estimated. A positive Poverty Premium was observed in 75.2% of observations, with a mean of 24.76% and a median of 12.50%. Premiums ranged from −48.81% to 425.00%, indicating substantial variation among products. Beverages recorded the highest category mean premium, whereas snacks showed a negative mean premium. The mean package-size ratio was 7.39, indicating that larger packages generally contained substantially more product than corresponding small formats. The correlation between package-size ratio and Poverty Premium was very weak (r = 0.008). On average, consumers would incur an additional Rs. 213.06 to obtain equivalent quantities through small packages. Although packaging weight was not measured, purchasing equivalent quantities through multiple small packages increases the number of packaging units entering the post-consumer waste stream. The findings indicate that small-format packages may provide immediate affordability while imposing higher unit costs and potentially increasing packaging intensity. Sustainable packaging strategies should therefore address affordability, unit pricing and packaging-waste reduction together.**

Keywords-Plastic Poverty Premium, small-format packaging, bulk packaging, plastic waste

I. INTRODUCTION

Plastic packaging is an important part of modern consumer markets because it provides convenience, portability, protection, and product preservation. However, the large volume of short-lived packaging has created significant challenges for plastic waste management. The problem is particularly important for small-format and sachet packaging because these formats often involve single-use, lightweight and flexible materials that are difficult to collect, sort and recycle. A recent scoping review identifies the growing "sachet economy" as an environmental concern and highlights the difficulties associated with managing small-format and multilayer packaging waste (Cullen *et al*., 2025).

Sri Lanka National Action Plan on Plastic Waste Management (2021-2030) adopts a preventive approach based on reducing, reusing, and recycling plastic and promotes a transition towards a circular economy (Ministry of Environment, 2021). Research on Sri Lanka's plastic material flows has also identified substantial challenges in plastic collection and recycling, demonstrating the importance of reducing plastic waste at source as well as improving waste-management systems (Samarasinghe *et al*., 2021; Balachandra & Konasinghe, 2025).

Small-format packaging, however, cannot be considered only as an environmental problem. It also has an important economic function. Consumers may select a small package because it requires less money at the time of purchase, even when the unit price is higher than that of a larger package. Research on bulk purchasing has shown that consumers can obtain lower unit prices through larger purchases, while liquidity constraints can limit the ability of some households to take advantage of these discounts (Mendoza *et al*., 2011; Gibson & Kim, 2018). Earlier evidence from South Asia similarly suggests that purchasing smaller quantities can expose consumers to quantity-related price premiums (Orhun and Palazzolo, 2019).

This creates a potential connection between poverty and packaging. A consumer with limited available cash may choose a small package because the immediate

payment is affordable. Over repeated purchases, however, the consumer may pay more per unit than a consumer who can afford the larger package. In this study, the term "Poverty Premium" refers to the percentage difference in unit price between a small package and its corresponding larger package, where a positive value indicates a higher unit price for the small package. The term "Plastic Poverty Premium" is used as the study's broader concept linking this potential price disadvantage with the packaging-unit implications of repeated small-format purchasing. The study does not directly measure household poverty or identify low-income consumers.

Existing research has largely examined the economic issue of bulk discounts and the environmental issue of plastic packaging separately. Less attention has been given to their intersection, particularly in the Sri Lankan market. This study therefore applies the concept of the Plastic Poverty Premium to examine the economic and packaging dimensions together. Specifically, the study aims to (i) quantify differences in unit prices between small-format and larger packages, (ii) describe the distribution of the Poverty Premium across eight product categories, (iii) examine the relationship between package-size ratio and Poverty Premium, and (iv) estimate the additional expenditure associated with obtaining equivalent quantities through small packages. The study also considers the implications of repeated small-format packaging for the number of packaging units entering post-consumer waste streams.

II. Materials and Methodology

A. Study design and data collection

A quantitative market-observation approach was used to analyse 125 consumer product observations available in the Sri Lankan market. Data were collected during August 2026 over a period of approximately three to four days through direct observations during visits to major supermarket chains, as well as selected small grocery stores. These outlets were purposively selected to capture the availability and retail prices of small-format packages across different retail settings. Additional product and price information was obtained from the online platforms of selected supermarkets where required. The observations covered eight product categories: beverages, dairy, household cleaning, ingredients, instant foods, laundry, personal care, and snacks. For each comparison, a commercially available smaller package was matched with a corresponding larger package of the same or a comparable product. Small and large were defined relatively within each matched comparison rather than by a fixed package-size threshold. The dataset therefore includes both same-brand and comparable cross-brand observations where suitable package-size comparisons were available. Promotional prices were not intentionally selected, although short-term retail price variation cannot be excluded because the observations were collected within a short period. The category allocation was purposive and reflects product availability during data collection rather than a statistically representative market sample.

Unit prices were calculated on a common quantity basis. The Poverty Premium was calculated as the percentage difference between the small-package unit price and the larger-package unit price: Poverty Premium (%) = [(small-package unit price-larger-package unit price) / larger-package unit price] × 100. A positive value indicates that the small package has a higher unit price, while a negative value indicates a lower unit price. The package-size ratio was calculated by dividing the quantity of the larger package by the quantity of the small package. Additional expenditure was estimated by calculating the cost of purchasing an equivalent quantity through small packages and comparing this with the price of the larger package. Packaging materials were recorded according to the observed packaging format. The analysis identifies plastic-containing packaging but does not estimate the mass of plastic waste because packaging weight was not measured consistently.

B. Statistical analysis

Data processing and descriptive analysis were conducted using Microsoft Excel. Mean, median, standard deviation, minimum and maximum values were calculated for the Poverty Premium, package-size ratio and additional expenditure. Category-level means and medians were used to describe variation across product categories. Pearson correlation was used to assess the linear association between package-size ratio and Poverty Premium. No additional inferential tests were applied because the analysis presented in the study is based on the descriptive calculations and correlation recorded in the final Excel analysis sheet.

III. RESULTS

A. Overall Poverty Premium

The 125 market observations covered eight product categories. Instant foods contributed the largest number of observations (25), followed by ingredients (23), personal care (22), beverages (17), snacks (16), dairy (10), household cleaning (7) and laundry (5).

Across all observations, the mean Poverty Premium was 24.76%, while the median was 12.50%. The standard deviation was 64.47%, with values ranging from −48.81% to 425.00%. A positive Poverty Premium was observed in 94 observations (75.2%). Seven observations (5.6%) recorded no difference in unit price, while 24 observations (19.2%) recorded a negative premium. These results show that a higher unit price for the smaller package was common in the observed sample, but it was not universal.

B. Differences among product categories

The magnitude of the Poverty Premium varied across product categories. Beverages recorded the highest mean premium at 89.85%. Household cleaning products recorded a mean of 26.98%, while personal care products recorded 27.64%. Laundry recorded 27.84%. Instant foods recorded 17.15%, ingredients 14.72%, and dairy 3.31%. Snacks recorded a negative mean of −10.57%.

TABLE 1. Poverty Premium by product category

Product category	n	Mean (%)	Median (%)
Beverage	17	89.85	19.05
Laundry	5	27.84	36.05
Personal care	22	27.64	23.80
Household cleaning	7	26.98	30.21
Instant foods	25	17.15	13.64
Ingredients	23	14.72	3.45
Dairy	10	3.31	5.61
Snacks	16	−10.57	−2.20

C. Package-size ratio and additional expenditure

The mean package-size ratio was 7.39, with a median of 4.38. The minimum observed ratio was 1.25 and the maximum was 43.13. This means that, on average, the larger package contained approximately 7.39 times the quantity of its corresponding small package. Consequently, consumers seeking an equivalent quantity through small packages would generally need several individual packages rather than one larger package. The mean additional expenditure associated with obtaining equivalent quantities through small packages was Rs. 213.06, with a median of Rs. 120.00. The observed range was −Rs. 600 to Rs. 2,300. The correlation between package-size ratio and Poverty Premium was r = 0.008, indicating an extremely weak linear relationship. Therefore, larger differences in package quantity do not automatically result in proportionately higher unit-price premiums.

The overall results indicate that small-format purchasing can involve both a higher unit price and repeated packaging consumption. However, the weak correlation shows that package-size ratio alone does not explain the variation in the Poverty Premium.

IV. DISCUSSION

The findings demonstrate an important economic and environmental connection between small-format and larger packaging. Three-quarters of the sampled observations recorded a positive Poverty Premium, indicating that consumers purchasing smaller quantities frequently paid more per unit. The result is consistent with research showing that bulk purchasing can generate lower unit prices and that financial constraints may limit consumers' ability to take advantage of these savings.

The important issue is therefore not simply whether a small package has a lower retail price. In many cases, the small package is cheaper at the point of purchase because it requires less cash. However, its higher unit price means that repeated purchasing can increase total expenditure. This represents the central economic dimension of the Plastic Poverty Premium.

The environmental implication is closely connected to the number of packages required to obtain an equivalent quantity. The average package-size ratio of 7.39 means that a consumer may need several small packages to obtain approximately the quantity contained in one larger package. If the small packages are plastic-containing, repeated purchases can increase the number of packaging units entering the post-consumer waste stream. However, this study did not measure packaging mass; therefore, the findings should not be interpreted as a quantitative estimate of the amount of plastic waste generated.

This distinction is particularly important for sachets and other small flexible packages. Recent research identifies small-format sachets as a significant waste-management challenge because their small size, low material value and multilayer construction can make collection and recycling difficult. Thus, even where an individual small package contains relatively little plastic, repeated consumption can produce many post-consumer packaging units.

The findings should not, however, be interpreted as evidence that small packages are inherently undesirable. Small-format packages can provide an immediate affordability advantage because they require less money at the point of purchase. The observed negative premiums also show that smaller packages do not always have higher unit prices. The results therefore support a more balanced interpretation in which affordability, unit price and packaging intensity need to be considered together. The present study identifies these relationships in observed market data; it does not establish that packaging size itself causes the observed price differences.

The weak correlation between package-size ratio and Poverty Premium also indicates that packaging size is not the only factor determining price differences. Product category, brand, market competition, packaging costs and pricing strategies may contribute to the observed variation. This suggests that interventions should be based on product and packaging systems rather than assuming that all small packages create the same economic or environmental effect.

The Sri Lankan context strengthens the importance of this issue. The National Action Plan on Plastic Waste Management 2021-2030 places emphasis on

prevention, reduction, reuse, recycling, and circular-economy approaches. Recent Sri Lankan research also highlights the continuing need to improve plastic collection, recycling, and post-consumer packaging management.

The results therefore support a combined policy approach. First, consumers should have clearer unit-price information so that package prices can be compared on a common quantity basis. This is relevant because 75.2% of the observations recorded a positive Poverty Premium. Second, affordable small-quantity purchasing options could be complemented by refill, reuse and lower-packaging-intensity alternatives where feasible. The mean package-size ratio of 7.39 indicates that obtaining equivalent quantities through small packages may require several packaging units. Third, packaging-waste strategies should consider the number of small-format units entering waste streams, while recognising that the present study did not measure packaging mass. These implications are based on the observed market prices and package-size comparisons rather than on a direct assessment of household poverty or plastic-waste quantities.

Most importantly, plastic reduction policies should recognize the relationship between affordability and environmental sustainability. A policy that simply eliminates small packages could create difficulties for consumers who cannot afford larger upfront payments. Conversely, continued growth of disposable small-format plastic packaging can increase the number of packaging units entering waste streams. A more sustainable approach is therefore to develop affordable small-quantity purchasing models with lower packaging intensity.

V. Conclusion

This study examined the Plastic Poverty Premium associated with small-format packaging in Sri Lanka using 125 market observations. The findings show that small-format packages frequently have higher unit prices than larger packages. A positive Poverty Premium was observed in 75.2% of the observations, with a mean premium of 24.76% and a median of 12.50%.

The analysis also demonstrates a substantial difference in package quantities. The mean package-size ratio was 7.39, indicating that several small packages may be required to obtain an equivalent quantity contained in one larger package. This creates an important environmental consideration when the small packages are plastic-containing because repeated purchases can increase the number of packaging units entering the post-consumer waste stream.

The mean additional expenditure of Rs. 213.06 further demonstrates the potential economic burden associated with repeated small-format purchasing. However, the negative premium observations and the weak correlation between package-size ratio and Poverty Premium show that the relationship is not universal and that other market factors influence package pricing.

The Plastic Poverty Premium therefore represents a useful framework for examining consumer affordability and packaging sustainability together. Small packages can provide immediate affordability, but they may impose higher unit costs and create more packaging units for equivalent consumption. The study has several limitations. The 125 observations were purposively selected, the category sizes were uneven, and the data were collected over only three to four days in August 2026; therefore, the results should not be treated as representative of all Sri Lankan retail markets or all time periods. Packaging weight was not consistently measured, and household socioeconomic characteristics were not collected. Brand, formulation, retailer and other pricing factors were not separately modelled. Future studies should use larger and more systematic samples, repeated observations over time, packaging-mass measurements and household-level socioeconomic information to examine the Plastic Poverty Premium more comprehensively.

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